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Publication Number 810-00223

ISDN 1000

Hand-Held ISDN Line Tester

Software Revision 2.4

USER'S MANUAL

Digitech Industries, Inc.
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Ridgefield CT 06877 USA
Phone (203) 438 - 3731
FAX (203) 438 - 4184

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Safety

Some voltages required for operating the ISDN 1000 may be hazardous to the operator who fails to exercise reasonable care when handling the equipment. The unit should be properly grounded when powered by the AC adapter, and any internal maintenance should be performed only by qualified personnel.

The tester and its charger should not be operated near water and should be operated only from the type of power source indicated on the marking labels. If you are not sure of the type of power you have, contact your Digitech representative.

Refer to the maintenance section of this manual for instructions on returning the unit for service.

Applications Support

To get the most efficient use of all available options included on your ISDN tester, Digitech provides applications support for technical questions. If you have any questions after reading the section of the manual regarding your application, please contact a Digitech technical service representative at (203) 438-3731.

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Section 1
Unpacking

Your Complete ISDN Kit

Included in your ISDN 1000 shipping container will be the following standard parts and optional accessories as ordered:

Standard Parts

•Basic unit

ISDN 1000 hand-held line tester and internal battery pack, standard S/T interface and optional interfaces ordered will be installed.*

•Cables

RJ45 to RJ 45	Connects the tester to an RJ45 jack.
RJ45 to RJ11	Connects the tester to an RJ11 jack.
RJ45 to two alligator clips	Connects the tester to terminal block.

(Alligator clips can be specified as regular or miniature.)

•AC power adapter

120V to 16VDC, recharges internal batteries.

•User manual

Instructions on how to use the tester.

Optional Parts

•Interfaces

AMI	For connection to AT&T AMI ISDN lines.
2B1Q	For connection to all 2B1Q ISDN lines.
P-Phone (EBS)	For connection to Northern Telecom P-Phone lines.
POTS	For connection to POTS lines.
•Softpak	For easy transport and protection of unit.

Note: See Accessories in the Appendix of this manual for other optional accessories.

If any of the items ordered are missing or damaged, please contact a Digitech customer service representative at (203) 438-3731.

*The interfaces included in your unit will appear on the packing slip and container markings. To verify the interfaces installed in your tester, turn the unit on and press each line type key after you have charged the unit. (See the Power Section for instructions.) If the interface is installed, the LED under the selected line key will light. If the interface is not installed, the LED will not light, and a message similar to the following will appear on the display: "P-Phone Interface Not Installed. Select A Different Line Type".

Section 2
Overview

Purpose of This Tester

The ISDN 1000 is a portable tester which is used to test the "U" and "S/T" interface points of ISDN basic rate (BRI, 2B+D) lines and NT1's. It can also be used for testing Northern Telecom P-Phone (EBS Electronic Business Service) lines and POTS (analog) lines.

Once connected to a line, the ISDN 1000 can be used to:

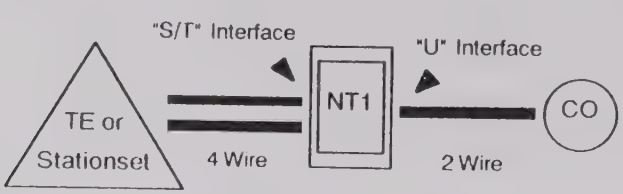
- place and receive voice calls
- test line quality and loss tolerance
- acquire and display the status of line synchronization
- determine line power presence and polarity
- determine ISDN information and protocol states
- determine and display directory numbers
- determine the central office line card identification
- acquire and display incoming caller ID on ISDN and POTS lines
- acquire and display feature assigned to station set keys

The ISDN 1000 allows you to quickly determine if basic service is working. If not, the tester helps you to quickly pinpoint and resolve the problem with simple GO/NOGO procedures.

The ISDN 1000 combines many automatic features including autoconfiguration to make testing easier and faster. Many tests can be done by pressing only one or two keys. Not only is the ISDN 1000 easy to use, but it also provides many configuration options which allow you to customize it to your particular testing requirements.

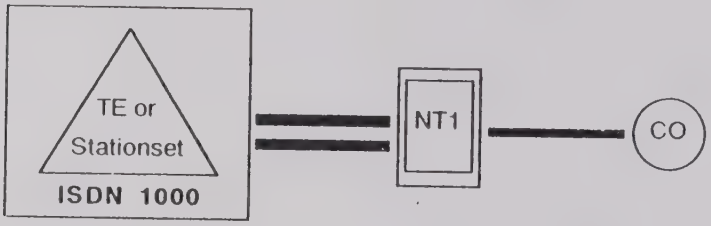
Applications

If the correct line interface modules are installed, the ISDN 1000 can be used as a butt-in set for POTS, P-Phone and ISDN S/T, 2B1Q and AMI basic rate (BRI) lines. The following diagram shows the testing reference points of a typical ISDN line:

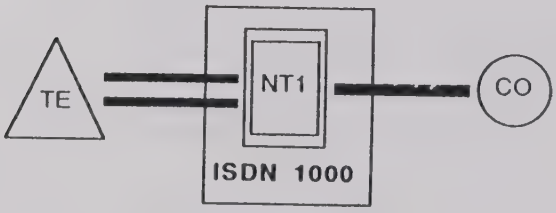


Normal ISDN BRI Line

The following diagrams show typical applications of the ISDN 1000:

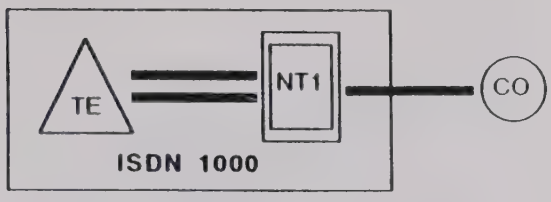


A TE for ISDN BRI Lines

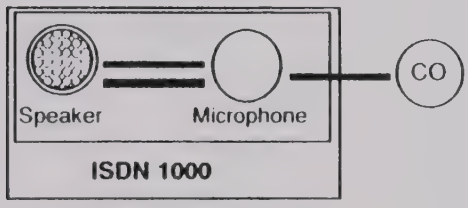


An NT1 for ISDN BRI Lines

Further applications of the ISDN 1000:



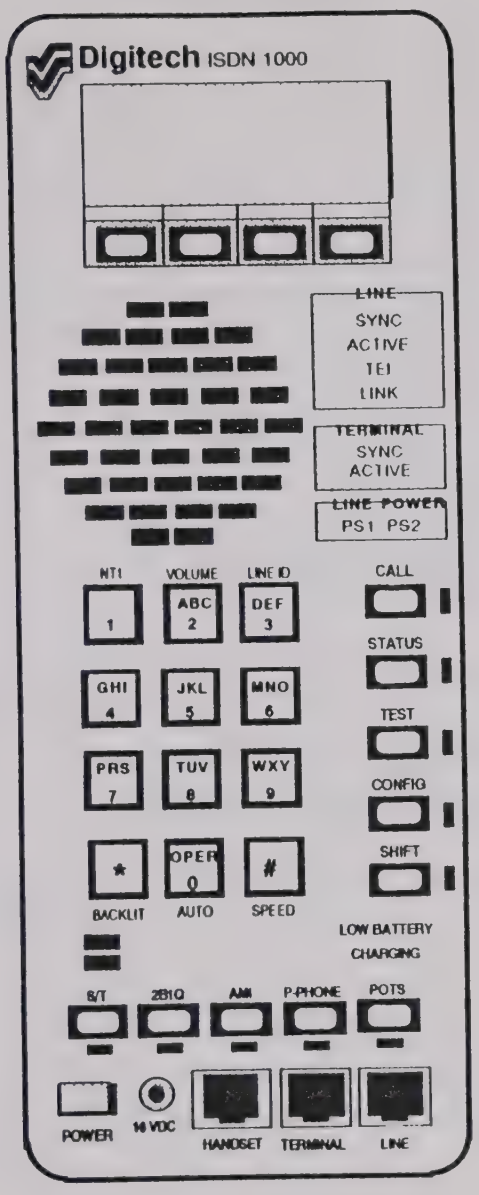
Both the TE and NT1 for ISDN BRI Lines



A Butt-In for POTS Lines

A Primary Station for P-Phone (EBS) Lines

FRONT PANEL

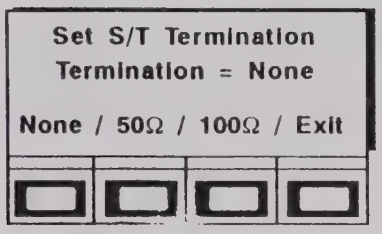

Digitech ISDN 1000
LINE
SYNC
ACTIVE
TEI
LINK
TERMINAL
SYNC
ACTIVE
LINE POWER
PS1 PS2
NT1
VOLUME
LINE ID
CALL
1
ABC 2
DEF 3
STATUS
GHI 4
JKL 5
MNO 6
TEST
PRS 7
TUV 8
WXY 9
CONFIG
SHIFT
*
OPER 0
#
BACKLIT
AUTO
SPEED
LOW BATTERY
CHARGING
S/T
2B1Q
AMI
P-PHONE
POTS
POWER
16 VDC
HANDSET
TERMINAL
LINE

Section 3
Features

This section provides a brief description of the display, keys, switches, LED's, jacks, and voice features.

LCD - Liquid Crystal Display

The backlit LCD has four lines of 20 characters each. It displays status messages, test results, prompts and softkeys.



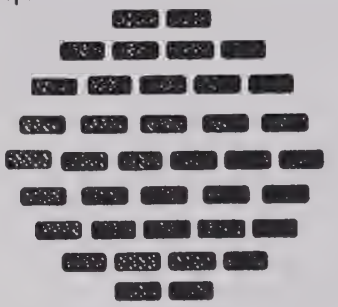
Softkeys

The keys under the display are called softkeys because their functions change depending on the requirements of each particular screen.

EXAMPLE: Pressing the second key under the display above selects the 50 ohm T-Termination.

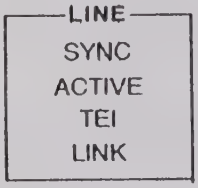
Speaker

The holes on the left side of the front panel are over the speaker portion of the tester's speakerphone.



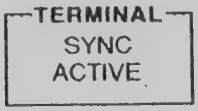
Line LED's

Line LED's indicate the status of an ISDN line connected to the LINE jack.



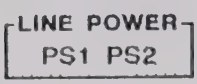
Terminal LED's

Terminal LED's indicate the status of an ISDN TE connected to the TERMINAL interface when the tester is configured as an NT1.



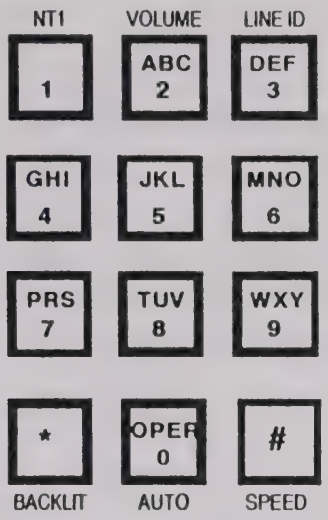
Line Power LED's

Line power LED's indicate status and polarity of power on the line under test.



Numeric Keypad

Like the keypad on a touchtone phone, the numeric keypad is used to place calls, select functions, enter speed dial numbers and names and input line values.



Six keys on the numeric keypad have additional functions labeled in blue. They are NT1, Volume, Line ID, Backlit, Auto and Speed. To activate a function, press <SHIFT> then the appropriate key to:

- **NT1** Configure the tester as an NT1.
- **Volume** Change the volume of the speakerphone or handset.
- **Line ID** Acquire and display the directory number and central office line card equipment number for AT&T ISDN ines configured with BRITL test facilites; autodial the ANA number for POTS lines.
- **Backlit** Turn on the display backlight for viewing in dark areas. The backlight will automatically turn off after 60 seconds of no user activity or you can turn it off by pressing <SHIFT> and <BACKLIT> again.

- **Auto** Initiate autoconfiguration of the line.
- **Speed** Select speed dial numbers.

Major Function LED's and Keys

These keys are used to select the function shown above the key. LED's on the right of the keys indicate that the function has been selected.

CALL

Press this key to make or answer a call. The LED lights when the call is in progress.

STATUS

Press this key to display status and configuration of a line under test.

TEST

Press this key to select tests.

CONFIG

Press this key to enable the configuration function.

SHIFT

Press this key to enable functions on the numeric keypad.

Battery Charging Indicators

Two LED's indicate the status of battery power.

LOW BATTERY
CHARGING

Microphone

The two holes on the left of the tester above the line type keys are over the microphone portion of the tester's speakerphone.

Line Type Keys

Five line interface keys allow line types to be manually selected. The LED below the key will light when its line type is selected.

Power Switch

This switch turns the tester on and off.

Jacks

Four jacks are located at the bottom of the tester:

- **16 VDC** jack used to connect the AC adapter for powering the tester or recharging the batteries.
- **Handset** RJ11 jack to connect a telephone, headset, handset, butt-in set or CAT (craft access terminal).
- **Terminal** RJ45 jack used to connect terminal equipment when the tester is configured as an NT1 for ISDN lines.
- **Line** RJ45 jack used to connect the line to be tested.

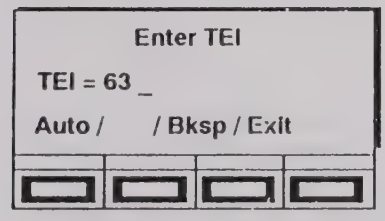
Section 4
Instructions

Manual Conventions

It is best to look over the entire ISDN 1000 manual and understand the instructions before using the tester. All warnings and instructions should be followed carefully.

To make this manual easy to understand the following conventions are used:

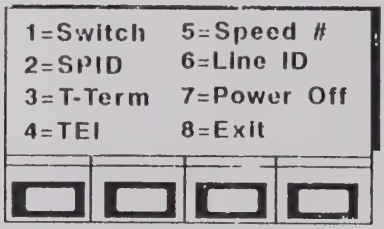
Keys	<SHIFT>	Keys are designated by capital letters bracketed with angle braces.
Softkeys	Auto	Softkey selections are underlined. Softkeys appear on the bottom line of many displays, such as the one shown below. To enable the softkey command, press the key directly below the prompt.



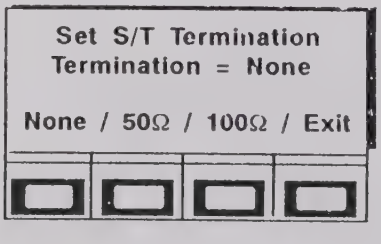
Display Messages	"Enter TEI"	Display messages appearing in the text of this manual will be in quotation marks, such as the "Enter TEI" prompt from the screen above.

General Operating Conventions

Exit To exit a function or test, press the key corresponding to the Exit command. Any changes made on the display being exited will be saved. The far right softkey will always function as an Exit command and, in addition, the <8> key can also be used when indicated in the display. Either method could be used for the screen shown below. Note that use of the last softkey for exit can be used even for screens that don't display the "Exit" softkey prompt.



Menus Exiting a menu backs you out of a function, one menu at a time. For example, pressing <3> from the screen above causes the screen below to appear, and pressing Exit from the screen below returns you to the screen above.



Function Keys For Fast Exit And Start

In order to terminate any <STATUS>, <TEST>,<CONFIG> or <SHIFT> function without using the Exit command and start a new function, just press a new function key. The tester will retain all changes made in the current function and begin the new function. If you press the same key as the function you are using, the tester will terminate the function, retain all changes made and return you to idle or "READY". Operating the tester in "Call" is described in the Calling Section.

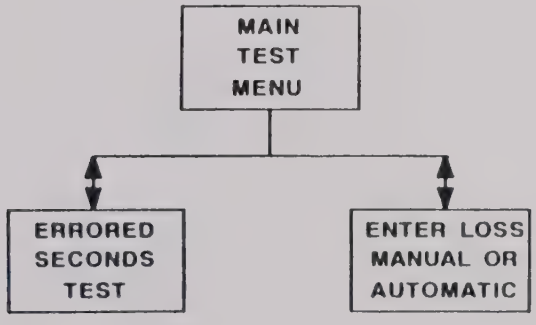
Application Sensitive Screens

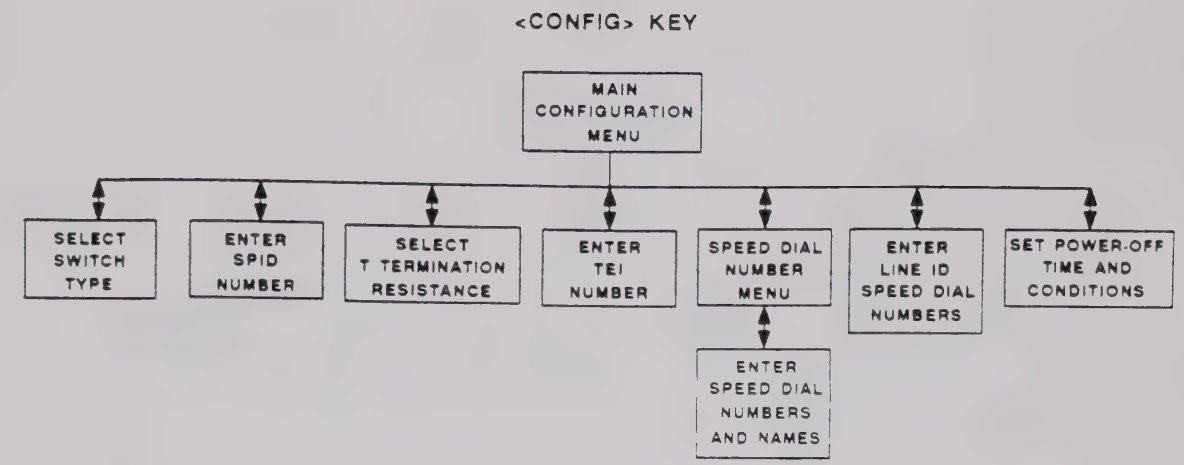
The kinds of tests and configuration options that can be selected are different for different line types. The tester is designed so that only the options and tests possible for the line type configured can be selected. If you try to select an invalid option or test, an error message will appear on the display.

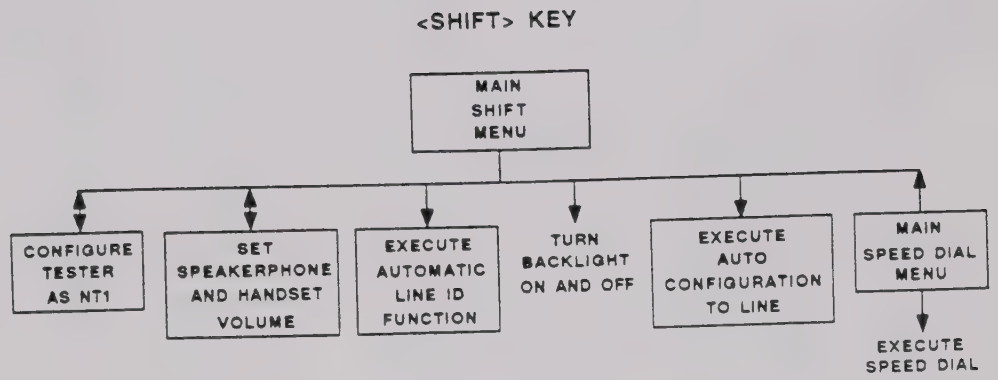
Function Key Menus

The ISDN 1000 is designed to execute line functions simply and with minimum keystrokes. Function keys and single level menu structures are used to implement this design goal. Menu structures for the <TEST>, <CONFIG> and <SHIFT> function keys are shown below for reference:

<TEST> KEY




<CONFIG> KEY
MAIN CONFIGURATION MENU
SELECT SWITCH TYPE
ENTER SPID NUMBER
SELECT T TERMINATION RESISTANCE
ENTER TEI NUMBER
SPEED DIAL NUMBER MENU
ENTER SPEED DIAL NUMBERS AND NAMES
ENTER LINE ID SPEED DIAL NUMBERS
SET POWER-OFF TIME AND CONDITIONS


<SHIFT> KEY
MAIN SHIFT MENU
CONFIGURE TESTER AS NT1
SET SPEAKERPHONE AND HANDSET VOLUME
EXECUTE AUTOMATIC LINE ID FUNCTION
TURN BACKLIGHT ON AND OFF
EXECUTE AUTO CONFIGURATION TO LINE
MAIN SPEED DIAL MENU
EXECUTE SPEED DIAL

Section 5
Installation

Connecting to the Line

The ISDN 1000 can be connected to the line you want to test with any cable equipped with the proper connector.

Use RJ45 plugs with RJ45 jacks and RJ11 plugs with RJ11 jacks on the unit whenever possible for more reliable connections and to insure longer life. RJ11 plugs can be used with RJ45 jacks but are not recommended. Miniature handset plugs will not make a good connection with the RJ11 HANDSET jack.

Connectors

The ISDN 1000 connects to analog POTS, P-Phone and ISDN lines at both "U" and "S/T" interfaces through the RJ45 LINE connector.

When the tester is connected to the "S/T" interface of an ISDN line, it functions as a TE or station set. When the tester is connected to the "U" interface of an ISDN line, it functions as a combination TE / NT1, when not configured as an NT1 and as an NT1 only when configured as an NT1.

TE/Terminal Equipment connects to the tester through the RJ45 TERMINAL connector. This connector is only used when the tester is configured as an NT1 on ISDN lines. When configured as an NT1, the tester is attached to the "U" interface of the line by the LINE connector.

The RJ11 HANDSET connector supports connections to two and four wire devices such as butt-in sets, telephones, handsets, headsets and CAT's (craft access terminal).

External power is applied to the unit through the 16VDC connector.

Section 6
Quick Start

To find out how easy it is to use the ISDN 1000, follow this procedure:

- Turn the unit on and plug the line to be tested into the LINE jack.
- If the tester does not respond with "Ready", press <SHIFT> then <AUTO>.
- The tester configures to the line and displays the "READY" message.
- Press <CALL> to make a call and wait for the dial tone.
- Dial a number using the number keypad.
- Talk using the tester's speakerphone.
- Press <CALL> again to disconnect.

The ability to place a call verifies a working line. If the tester doesn't display the "READY" message, you may have a special line condition which requires changing the tester's configuration manually. See the Configuration Section for more details.

Section 7
Power

Battery Recharging

The ISDN 1000 is powered by an internal rechargeable battery or the AC power adapter included with the unit. When you first receive the tester, recharge the battery pack until the "Charging" LED does not light when the AC power adapter is connected. The battery pack should be recharged before extended use or when the low battery LED is lit.

The tester recharges in approximately three hours if it is turned off while being recharged. You can use it for four to seven hours after a full recharge, depending on the type of line interface used during testing. Use of the display backlight will further shorten this period and should be used only when necessary. The unit may be operated while it recharges.

If the tester is turned off while the AC power adapter is still plugged in, the batteries will completely recharge, then automatically turn off the recharge circuit. If you want to begin recharging again, the adapter must be unplugged and plugged in again.

Power Status LED's

"Low Battery" and "Charging" LED's are located just above the <POTS> line type key. They show the status of the internal battery. The "Low Battery" LED is lit when the internal batteries have less than 20 minutes of charge left.

The "Charging" LED is lit when the unit is recharging from the AC power adapter. The LED goes off when the internal battery is completely recharged.

Power Switch

The red "Power" switch is an on/off switch on the bottom left corner of the unit. Push this switch once to the In position to turn on the unit and again to the Out position to turn it off. The ISDN 1000 has an automatic power-off feature described later in this section. If the tester powers down automatically, the power switch must be pushed off and then on, to turn it on again.

Memory

When power is turned off, the tester will retain configuration parameters which have been selected, such as line and switch type, autodial numbers, automatic power-off parameters and Line ID numbers.

Power On Self Test

The ISDN 1000 performs a self test when you turn the unit on and displays the results:

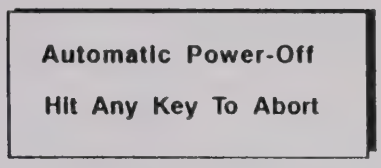
DIGITECH - ISDN 1000
VERSION 2.0
<Self Test Results>

The message "Self Test: Passed" or "Self Test: Failed" appears. If the test is passed, the ISDN 1000 will try to synchronize to a line and display the status of synchronization achieved. If the test fails, the message "Self Test: Failed" will remain and the unit will not function.

To retry the self test turn the unit off and on again. If the self test continues to fail, return the unit to Digitech for service.

Automatic Power-Off

This feature prevents accidental depletion of the internal battery power supply. The tester automatically powers off after a user programmable period of time if it is not being used. Ten seconds before the unit powers off, the unit beeps, the LED's blink and the following message will appear:



You may press any key during this warning to abort automatic power-off and return the tester to its last state.

Changing Power-Off Conditions

It is possible to change the time period and conditions causing automatic power-off. Refer to the Configuration Section of this manual for more information.

Changing the Battery

The battery has an expected life of 800 charges. If you cannot charge the battery, it may need replacing. Refer to Battery Replacement in the Appendix Section of this manual for instructions.

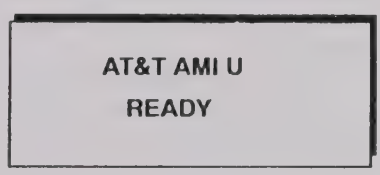
Section 8
Configuring

What is Configuration

Before testing, you must configure the ISDN 1000 for the line type, central office switch vendor and other parameters the line uses. Without this information, the tester will not synchronize to the line and testing cannot begin.

Automatic Synchronization to the Line

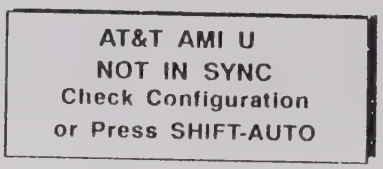
The tester automatically synchronizes to the line when the configuration settings are correct. Because the ISDN 1000 saves configuration settings when the unit is turned off, the tester tries to synchronize to the line, using those same settings, when it is turned back on. If line synchronization is successful, a screen similar to the following appears:



The top line of the display indicates the central office switch vendor and line type selected. The "READY" message on line two advises you the unit is ready for testing or placing calls. The automatic synchronization feature is particularly useful in applications where the same line type is repeatedly tested.

If The Tester Does Not Synchronize to the Line

If the configuration settings are incorrect or the unit isn't connected to a line, a screen similar to the following appears:



The top line of the display is a status line and shows one of the following choices depending on the central office switch vendor and line type selected:

"AT&T AMI U"
"AT&T 2B1Q U"
"AT&T S/T"
"POTS"
"NTI 2B1Q U"
"NTI S/T"
"NTI P-PHONE"

If the tester is set for the correct line type, the second line in the display indicates line synchronization status. Line two messages are shown below. Note that the messages reflect the line status LED'S.

"NOT IN SYNC"
"NOT ACTIVATED"
"TEI NOT ASSIGNED"
"LINK NOT ESTABLISHED"
"READY"

When POTS or P-Phone is selected, no message appears on line two of the display. To determine if P-Phone or POTS is correct, press <CALL>. If you hear a dial tone, the line type selection you made is correct. If the line is P-Phone, the PS1 LED lights before and after pressing <CALL>. If the line is POTS, the PS1 LED lights only after pressing <CALL>.

If the ISDN 1000 does not complete synchronization on an ISDN line, the third and fourth lines of the display are used for prompts, such as "Check Configuration, Press SHIFT-AUTO" or "Check Configured TEI".

Two Ways To Configure The Tester

The ISDN 1000 can be configured manually or automatically.

Autoconfiguration

Using the autoconfiguration function is easy. After the tester is connected to the line, press <SHIFT>, then <AUTO>. The tester will find the correct line type. It will then synchronize to the line and display the line type and a 'READY" message.

Autoconfiguration works on most lines. However if the line to be tested is open, the tester wil not be able t identify an ayparameters. If the tester can't determine the line type, the top line will be blank and the message "Unable to configure to line" will appear. Autoconfiguration can only configure to line types supported by interface modules installed in the tester.

Manual Configuration

When autoconfiguration is not used, options can be manually set in the tester

The first step in manual configuration is to select the correct line type. To do this, press one of the line keys at the bottom of the unit. To change the line type, press a different line key. If the line interface module is installed, the LED below the key will light when the key is pressed. If the line interface module is not installed, the LED will not light and a message similar to the following will appear: "AMI Interface Not Installed. Select New Line Type".

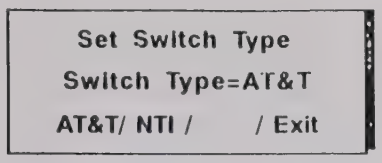
For POTS and P-Phone lines this is normally the only step required. ISDN lines require more choices.

To continue configuration, press <CONFIG>. The following **main configuration menu** will appear:

1=Switch	**5=Speed #**
2=SPID	**6=Line ID**
3=T-Term	**7=Power-Off**
4=TEI	**8=Exit**

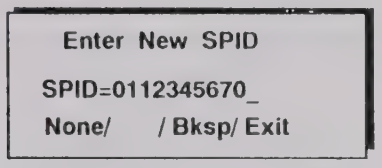
To change the configuration for one of the menu items, press the appropriate number key on the keypad. If you try to configure a menu item, such as TEI, that is not operative for the selected line or switch type, a Help message will be displayed. Press <8> to exit from this menu.

Press <1> from the main configuration menu to select the central office switch type for ISDN lines. The following type screen will appear:



Press AT&T to select AT&T or NTI for NTI (Northern Telecom). Press Exit to return to the main configuration menu.

Press <2> from the main configuration menu to enter a SPID number for ISDN lines. A screen similar to the following will appear:



Enter the new SPID number using the keypad. A SPID number for AT&T lines is made up of the seven digit primary directory number preceded by 01 and followed by 0. A SPID number for Northern Telecom may be up to 20 digits and is typically the 10 digit directory number (including area code) followed by a one or two digit suffix.

If the first key pressed after the "SPID" screen first appears is a number key, any SPID number that is already there will be blanked out and the digit from the number key pressed will appear in the first position. A cursor shows where the next digit will be entered. Pressing Exit will configure the line with the new SPID number and return you to the main configuration menu. If you don't want a SPID number, press None.

Pressing Bksp will move the cursor back one space and will delete the previous digit. To correct a SPID number, press Bksp until the cursor moves to the part of the number to be changed; then enter the correct numbers.

Press <3> from the main configuration menu to select the "S/T" interface termination resistance for ISDN lines. The following screen will appear:

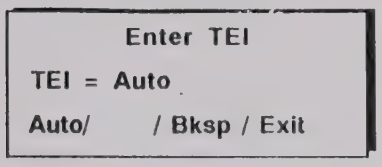
```
Set S/T Termination
Termination = None

None / 50Ω / 100Ω / Exit
```

Changing the S/T termination impedence can only be done when the tester is connected to the S/T interface of an ISDN line or configured as an NT1.

Press None to select no termination (Hi Z). Press 50Ω to select 50 ohms. Press 100Ω to select 100 ohms. Press Exit to return to the main configuration menu.

100 ohms is normally used when testing a point-to-point or point-to-multipoint line and the tester is the only TE on the line. 50 ohms is normally used when the NT1 is unterminated. None is normally used when testing a point-to-multipoint line and there are one or more TE's on the line along with the tester.

Press <4> from the main configuration menu to enter a TEI number for ISDN lines that require the TEI to be assigned by the TE. A screen similar to the following will appear:



Certain Northern Telecom lines require the TEI number to be set by the TE. For this application, TEI numbers are entered from this menu. To enter a new TEI number, press the number keys on the keypad. If the first key pressed after the "Enter TEI" screen first appears is a number key, any TEI number that is already there will be blanked out and the digit from the number key pressed will appear. A cursor shows where the next digit will be entered. To selectautomatic or dynamic TEI operation, press Auto. Pressing Exit will configure the line with the new TEI number and return you to the main configuration menu.

Notes: To determine which TEI number is active at any time, press <STATUS>, which will display the current TEI number along with other line parameters.

Pressing Bksp will move the cursor back one space and delete the previous digit. If you want to correct the TEI number, press Bksp until the cursor moves to the part of the number to be changed; then enter the correct number.

Only TEI numbers of 63 or less can be entered. TEI numbers greater than 63 are always set automatically. If you try to enter a TEI number greater than 63, the message "TEI Must Be < 64" will appear on the third line of the display.

Press <5> from the main configuration menu to enter speed dial numbers and names. A speed dial menu similar to the following will appear:

```
1=OFFICE      5=BRITL
2=555 2200    6=
3=LINE1       7=
4=438 4184    8=Exit
```

When you are finished entering speed dial numbers and names, press <8> to return to the main configuration menu. To enter or change a speed dial number or name, press the number key on the keypad corresponding to where you want it to appear and a screen similar to the following will appear:

```
Enter Speed Dial #1
NUM=438 3731_
Name=OFFICE
Name/ None/ Bksp/ Exit
```

```
Enter Speed Dial #1
Num=438 3731
NAME=OFFICE_
Num/ None/ Bksp/ Exit
```

The top line of the display tells you which number selection you are working on. The second line displays the number assigned to the selection. The third line displays the name assigned to the selection. The name of the line being worked on (NUM or NAME) will be displayed in all capital letters; the name of the other line will be displayed in lower case letters. A cursor also shows what line you are on and where the next digit or character will be entered.

If you are on the "NUM" line as in the screen on the left above, the first softkey is Name. Press Name to work on the "NAME" line. The cursor will move to the "NAME" line and the first softkey will change to Num, as in the screen on the right above. Press Num to return to "NUM" line.

The main speed dial number menu will display up to seven digits or characters. Numbers up to a combination of sixteen digits and pauses can be entered and stored. When the number stored is longer than seven digits, only the last seven digits of the number are displayed in the speed dial number menu selection.

If a number, but no name, is entered on this screen, the number will appear on the speed dial menu. If both a number and a name are entered on this screen, the name will appear on the main speed dial menu. If a name, but no number, is entered on this screen, the name will appear on the speed dial menu. However, if you try to use this selection for speed dial, the message "Cannot Do Speed Dial No Number Configured" will appear.

To enter a new number or to change an old number, the cursor must be positioned on the "NUM" line. Enter the new number by pressing number keys on the keypad. If the first key pressed after pressing Num is a number key, the number that is already there will be blanked out and the digit from the number key pressed will appear. Press None to blank out the "NUM" line.

Press <*> to enter a two second pause in the number. A pause is displayed as a period ".". Normally one pause is sufficient to get a second dial tone in PBX or similar applications. Two or more consecutive pauses can be entered to increase the delay. If you want a * to be sent in the dial string, hold the key down until the * appears on the display and then release the key to select it.

Press <#> to add a space to the number displayed. This makes the displayed number more readable without affecting the number dialed. If you want a # to be sent in the dial string, hold the key down until the # appears on the display and then release the key to select it.

To enter a new name or to change an old name for the speed dial number displayed, the cursor must be positioned on the "NAME" line. Enter characters using the keypad by holding down the appropriate key until the character appears on the screen and then release the key to select it. If the first key pressed after pressing Name is on the keypad, the name that is already there will be blanked out and the digit or character from the key pressed will appear. Press None to blank out the "NAME" line.

Most keypad keys provide four choices which are marked on the key. The 1, *, 0 and # keys provide choices which are not marked on the key but are in industry standard positions as follows:

<1> Q Z <0> space <#> - ( )

EXAMPLE: Hold down the <2> key and a 2 appears where the cursor was, followed by an A, then B, then C and then the 2 again, and so on. If you want to select B, release the key after you see the "B" and a "B" will be entered. The cursor will move to the next character position.

Pressing Bksp will move the cursor back one space and delete the previous digit. If you want to correct the speed dial number or name you are entering, press Bksp until the cursor moves to the part of the number or name to be changed; then enter the correct digits or characters. Press Exit to return to the speed dial menu.

Press <6> from the main configuration menu to enter speed dial numbers needed for the line ID function. A screen similar to the following will appear:

```
    Enter Line ID
AT&T BRITL:   9300_
pots:  555 1290
POTS/ None/ Bksp/ Exit
```

```
    Enter Line ID
at&t britl:   9300
POTS:  555 1290_
AT&T / None/  Bksp/ Exit
```

The second line displays any previously entered AT&T BRITL number. The third line displays any previously entered POTS ANA number. The name of the line being worked on (AT&T or POTS) will be displayed in all capital letters; the name of the other line will be displayed in lower case letters. A cursor also shows what line you are on and where the next digit will be entered.

If you are on the "AT&T" line, as in the screen on the left above, the first softkey will be POTS. Press POTS to work on the "POTS" line. The cursor will move to the "POTS" line and the first softkey will change to AT&T, as in the screen on the right above. Press AT&T to return to "AT&T" line.

To enter or change a previously entered AT&T BRITL number, the cursor must be positioned on the "AT&T BRITL" line. Enter the new number by pressing number keys on the keypad. If the first key pressed after pressing AT&T is a number key, the number that is already there will be blanked out and the digit from the number key pressed will appear. Press None to blank out the "AT&T" line. To enter or change a previously entered POTS number, press POTS to position the cursor on the "POTS" line and follow the same procedure.

Press <*> to enter a two second pause in the number. A pause is displayed as a period ".". Normally one pause is sufficient to get a second dial tone in PBX or similar applications. Two or more consecutive pauses can be entered to increase the delay.

Press <#> to add a space to the number displayed. This makes the displayed number more readable without affecting the number dialed.

Pressing Bksp will move the cursor back one space and delete the previous number. If you want to correct the line ID number you are entering, press Bksp until the cursor moves to the part of the number to be changed, then enter the correct number. Press Exit to return to the main configuration menu.

Press <7> from the main configuration menu to change the timing and conditions causing automatic power-off. A screen similar to the following will appear:

```
Power-Off = 3 Min
No Power-Off When
                  16V
Time / Opt /      / Exit
```

The current options for the unit will be displayed. The factory set options are 3 minutes and 16V to disable automatic power-off. Press Exit to return to the main configuration menu.

Press Time to set or change the time for automatic power-off. This will change "Power-Off" to "Set Time", blank the minutes area, position a cursor on line one of the display and add a None softkey in the third position. Enter the number of minutes of delay required for automatic power-off by pressing the appropriate keys on the keypad. If you make an error, press Time and start again. Press None to disable automatic power-off and "Disabled" will appear on line one of the display.

Press Opt to change the conditions for automatic power-off and line three of the power- off screen will change as in the following screen:

```
Power-Off = 5 Min
No Power-Off When
SYNC  call  NT1  16V
Time/ Opt /On-off/ Exit
```

The ISDN 1000 will automatically power off if not in use (no keys pressed by user) after a user-programmable number of minutes. Four conditions prevent this:

"Sync"	Tester is synchronized to a line.
"Call"	Tester is in an active call.
"NT1"	Tester is configured as an NT1.
"16V"	Tester is being powered via the AC power adapter.

You can select these conditions independently and in any combination. A cursor indicates the condition that can be selected. In the screen above, the cursor is under the "SYNC" selection. To move the cursor, press Opt and the cursor will move one selection to the right. When the cursor is positioned under the last selection, press Opt and it will move under the first selection on the far left.

To select a condition for aborting automatic power-off, press ON-off after the cursor has been positioned under that selection. When the condition is selected, the selection will appear in all capital letters. Pressing ON-off again will toggle the condition off and the selection will appear in lower case letters.

In the first power-off screen above "16V" is selected. This will prevent the tester from automatically powering down when the tester is powered by the AC adapter.

The normal power-off screen will only display the conditions for power-off that have been selected unless Opt has been pressed and conditions to abort automatic power-off are being selected. The two power-off screens above provide an example of both methods of display for line three. Press Exit to return to the main configuration menu.

Configuring Your Tester as an NT1

The ISDN 1000 can be used as an NT1 on ISDN lines. Before putting the tester in this mode, be sure you have configured the line to the correct "U" interface and central office switch. Press <SHIFT> then <NT1> to set up the tester as an NT1. Refer to NT1 testing in the Test Section of this manual for detailed instructions.

Changing the Audio Volume of Your Tester

To change the volume of your tester's speakerphone or externally connected handset, press <SHIFT> then <VOLUME>. While this is normally done during an active call, it can be done at any time. Refer to the Calling Section of this manual for instructions.

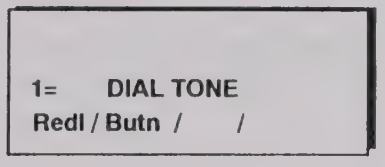
Section 9
Calling

The <CALL> LED

There is an LED next to the <CALL> key. It will be lit whenever a call is active. It will blink to indicate an incoming call or when you are speed dialing, viewing a status or test screens, inserting loss or adjusting audio volume during an active call.

Outgoing Calls

Before a call can be made, the tester must display "READY" which indicates the tester is properly configured to the line. Press <CALL> to initiate the call and the LED next to <CALL> will light and the status line will disappear. The message "DIAL TONE", active call appearance and the softkeys Redl and Butn will appear as shown on the screen below, and you will hear dial tone through the tester's internal speakerphone or an externally attached handset:



The tester will make the call on the call appearance shown in the display. To select a different call appearance for dialing use the button emulation feature described later in this section. If all call appearances are busy, the tester will display "LINE BUSY" and return you to "READY" two seconds later.

Enter the Correct SPID for ISDN Calls on Multipoint Lines

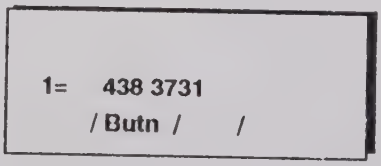
If you are on a multipoint AMI, 2B1Q or S/T ISDN line, the tester must be configured with the correct SPID number to place a call. A correct SPID number for AT&T lines is made up of the seven digit primary directory number preceded by an 01 and followed by an 0.

A SPID number for Northern Telecom may be up to 20 digits and is typically the 10 digit directory number (including area code) followed by a one or two digit suffix. Refer to the Configuring Section of this manual for instructions on how to enter a SPID number in the tester.

If the SPID is missing, the message "REQUESTED FACILITY NOT SUBSCRIBED TO" will appear and the tester will return you to "READY". If the SPID is incorrect, you will hear a stuttered dial tone when you attempt to dial and the tester will return you to "READY". In both cases the tester will display the help message "Check SPID Config".

Last Number Redial

Press Redial and the last number that you dialed will be dialed again. As soon as the redial begins, the Redial softkey disappears from the display number being dialed will appear on line three as shown in the screen below:



Manual Dialing

Enter the phone number manually using the keypad as you would with a telephone. As soon as the first number is pressed, the Redial softkey will disappear and the phone number, as it is entered, will appear on line three of the display.

Speed Dialing

To use the speed dial feature, press <SHIFT> and the following screen will appear:

```
1=NT1        *=Backlit
2=Volume     0=Auto
3=Line ID    #=Speed
             8=Exit
```

The <SHIFT> LED will be lit. Next press <#> and your speed dial menu will appear. A typical speed dial menu is shown below:

```
1=Office      5=BRITL
2=555 2200    6=
3=Line 1      7=
4=438 3731    8=Exit
```

Press the keypad number corresponding to the number you want to dial. The tester will automatically go off hook, wait for dial tone and dial the number while displaying normal call messages. The call appearance number and the phone number, as it is dialed, will appear on line four of the screen. After the number has been dialed, the <SHIFT> LED will go out and the <CALL> LED will be lit.

Speed dial can also used to dial after pressing <CALL> with the "DIAL TONE" message displayed or to send a string of numbers after a call is connected.

Button Emulation

Many station sets are designed with call appearance buttons and feature buttons in additon to their numeric keypad. The ISDN 1000 can simulate these buttons using the Butn softkey when the tester is connected to an AT&T, NTI or EBS (P-Phone) line.

To simulate a button:

- Press the Butn softkey and the following screen will appear:

```
Button Number = None _
None / Send / Bksp / Exit
```

- Enter a button number from 1 to 255 using the keypad.
- Press Send.
- To send another button number, enter it and press Send again.
- Press None to blank out a button number that has been entered.
- Press Bksp to edit a button number being entered.
- Press Exit to return to previous state.

Status Messages Inform You of the Progress of Your Call

During the call, the tester will display messages received from the switch on the top two lines of the display and normal and error call progress status messages on the bottom two lines of the display. Normal call progress message sequences are as follows:

Outgoing Call Messages	**Action**
READY	Press <CALL>
DIAL TONE	Dial
DIALING	
PROCEEDING	
RINGING	
CONNECTED or BUSY	Press <CALL>
DISCONNECT	
READY	

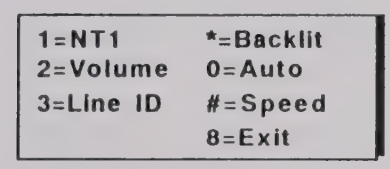
Incoming Call Messages	Action
READY	
INCOMING CALL	Press <CALL>
CONNECTED	Press <CALL>
DISCONNECT	
READY	

Talking During a Call

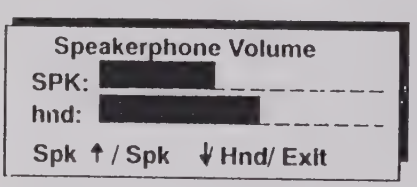
You can talk during a call using the tester's internal speakerphone or using a handset attached to the RJ11 HANDSET jack. When a handset is connected, the speakerphone will be turned off. Since the tester supports both two and four-wire telephones, almost any handset will work properly if conncected with an RJ11 plug. This includes butt-in sets, normal telephones, telephone handsets and headsets. The tester automatically selects 2 or 4-wire operation depending on the type of handset attached. Miniature handset plugs will not make a proper connection to the RJ11 jack on the tester and should not be used without an adapter cable.

Adjusting the Volume

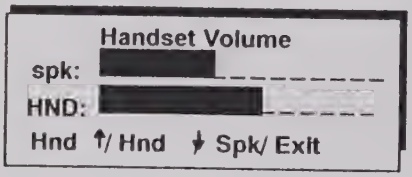
Volume can be adjusted on both the speakerphone and on handsets connected to the HANDSET jack at any time, including during an active call. You will be able to talk during the adjustment. First press <SHIFT> and the following screen will appear:



The <SHIFT> LED will light and, if during an active call, the <CALL> LED will start to blink. Then press <2> to adjust the volume and the following screen will appear:



The bar chart on the screen will show the volume of the speakerphone and handset. Press Spk ↑ to increase the volume of the speakerphone. Press Spk ↓ to decrease the volume of the speakerphone. Press Hnd to adjust the volume of a handset connected to the HANDSET jack and the following screen will appear:



Press Hnd ↑ to increase handset volume. Press Hnd ↓ to decrease the volume of the handset. Press Spk to return to the screen for adjusting the speakerphone volume.

When the adjustment is complete, press Exit or <CALL> to return to the normal call screen. If you made the volume adjustment from a screen other than call, Exit will return you to that screen.

Terminating a Call

Press <CALL> to terminate an active call. The screen message "DISCONNECT" and a disconnect cause message on line four will appear, followed two seconds later by the "READY" message.

Incoming Calls

Incoming calls can be recognized and answered when the tester is "READY". The tester will signal an incoming call with the message "INCOMING CALL" on line three of the display and an audible ringing tone from the tester's speaker. At the same time, the <CALL> LED will blink and the top status line will disappear. The tester is designed as a single line phone and will only accept one call at a time.

When the tester is connected to an ISDN line, the top line of the display will indicate the selected call appearance number from the switch. If the switch is configured to provide caller ID, the top line will also show the telephone number of the caller.

Displaying the Status Screen During an Active Call

If you want to get detailed status information during an active call, press <STATUS> and a status screen will appear. For information regarding the status screen, refer to the Status Section of this manual. To return to the normal call screen, press <CALL>.

Displaying the Errored Seconds Test Screen During an Active Call

If you want to run a new errored seconds test during an active call, press <TEST> and then <1>. For information regarding the operation of the errored seconds test screen, refer to the Test Section of this manual. To return to the normal call screen, press <CALL>.

Moving From Function to Function During an Active Call

You can move directly to <TEST> from <STATUS> by pressing <TEST> and directly to <STATUS> from <TEST> by pressing <STATUS> while calls are active. The <CALL> LED will blink until you return to the call mode. You can also move to <CONFIG> or <SHIFT> during an active call; however, care must be exercised not to make configuration changes that can disconnect a call.

Section 10
Status

Status Screen

The status function will display detailed information about the line under test and is particularly useful for ISDN lines. If the unit is not synchronized to the line or if no line is connected, the information fields will be blank. To view the status screen, press <STATUS>. The <STATUS> LED will light, and a screen similar to the following will appear:

```
AT&T      5ESS      P-P
TEI = 63      L3=U00
Lpbk=N  B1B2D  Chan=B1
     /     /     / Exit
```

The Top Line

There are three areas in the top line for status. The first area shows the switch vendor such as "AT&T" or "NTI". The second area shows the switch model such as "5ESS" or "D100". The third area shows either "P-P" for point-to-point or "M-P" for point-to-multipoint configuration.

The Second Line

The TEI number is displayed on the left and the layer three state of the ISDN protocol, as defined by CCITT, is displayed on the right. (See the Appendix Section, page 12-6, of this manual for a cross reference.)

The Third Line

This line displays loopback and channel assignment status. The information after "LPBK=" is loopback status. "T" is transparent and "N" is nontransparent loopback. "B1" indicates B1 channel loopback. "B2" indicates B2 channel loopback. "D" indicates D channel loopback. "NONE" is displayed if no loopback is active.

If any channel is not looped back, spaces will appear instead (i.e. loopback B1 and D only: "LPBK=T B1 D"). "CHAN=" indicates whether the B1 or B2 channel is assigned. "--" is used if no B channel is assigned.

The Fourth Line

This line contains the Exit softkey and, if more information is available on another screen, the More softkey. Press Exit to return to the previous screen.

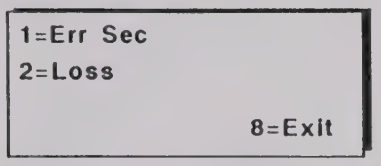
Viewing Status During an Active Call

Press <STATUS> during an active call to display the status screen. The call will proceed normally without interruption. The <STATUS> LED will light and the <CALL> LED will blink. To return to the normal call screen, press <CALL>.

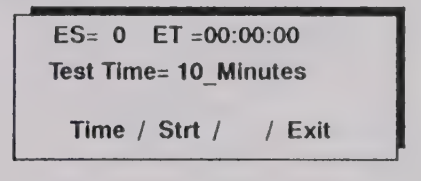
Section 11
Testing

ERRORED SECONDS TESTING

Errored seconds tests provide a measure of line quality for ISDN BRI lines. These tests are only available when the tester is configured for a "U" interface and measure the total of FEBE's (far end block errors) and NEBE's (near end block errors). To use the ISDN 1000 for errored seconds tests, press <TEST> and the following screen will appear:



Press <1> to initiate an errored seconds test and a screen similar to the following will appear:



The top line of the screen is the results line and is composed of first, the number of errored seconds (ES) and second, the elapsed time (ET) in hours, minutes and seconds. The second line of the screen displays the time interval last selected for the errored seconds test in minutes. The second line could alternately display the message "Halted: Lost Sync" if that condition occurred during a previous test. The third line will display the error rate performance of the test

Press Time to enter the test time in minutes for the errored seconds test. The minutes shown in line two will be blanked out and a cursor will be positioned to the far left. Enter the number of minutes using the keypad. If no number entry is made, the errored seconds test, once begun, will run indefinitely until the tester loses sync with the line.

Pressing Bksp, which appears only in the set time mode, will move the cursor back one space and will delete the previous digit. If you want to correct the number of minutes entered for the errored seconds test press Bksp until the cursor moves to the part of the number to be changed; then enter the correct numbers.

Press Strt to start an errored seconds test. The test will run for the number of minutes entered on line two. If the tester loses sync during the test, the test will stop and the message "Lost Sync At xx Min" will appear. The errored seconds test result screen will be retained until reset to zero by pressing Strt again, changing the line type or turning the unit's power off. The time entered for errored seconds tests will be permanently saved until you change or delete it. Press Exit to return to the main <TEST> menu. A typical errored seconds results screen is shown below:

```
ES= 2  ET=00:10:00
Test Time= 10_Minutes
Err Rate=2.681xE-09 OK
Time / Strt /      / Exit
```

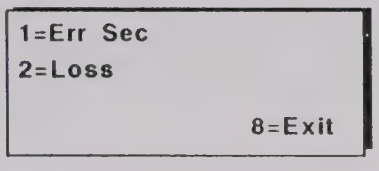
The message "OK" or "BAD" will appear after the actual error rate performance displayed in line three to let you know if the error rate is in specification ("OK") or out of specification ("BAD"). The specification calls for an error rate of no more than 1 x E-07 for 2B1Q lines and no more than 1 x E-06 for AMI lines. If no errors have been detected, the message "No Errors" will be displayed on line three.

INSERTION LOSS TESTING

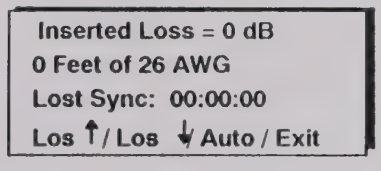
It is important in many installations to determine how long a line can be without exceeding the specified error rate performance. In order to determine this, the tester allows loss to be inserted at both the "S/T" and "U" interface points of the line under test to simulate extra cable. By determining how much loss can be inserted, an estimate of acceptable additional line length can be made.

To Add Insertion Loss

The tester should display the "READY" message. Press <TEST> and the following screen appears:



Press <2> to begin the insertion loss test and the following screen will appear:



Each time you start a loss test, "Inserted Loss" and "feet of 26 AWG" will be set to "O". Up to 15 dB of loss can be inserted at the "U" or "S/T" interface points of the line under test in 15 steps, 1 dB at a time.
Each time you press Los ↑ 1 dB of loss is inserted. Each time you press Los ↓ 1 dB of loss is subtracted. "Inserted Loss" tells you how much loss you have added to the line and "Feet of 26 AWG" converts the loss to its equivalent in feet of 26 gauge wire.

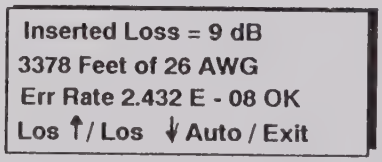
Manual Insertion Loss Test

Line three of the screen displays the error rate performance of the line. At some point, adding loss may cause the tester to lose sync. When this happens the message "Lost Sync: 00:00:XX" appears on line three. Press the second softkey to reduce loss by one dB and the tester should recover sync and restart the error rate performance display on line three of the screen.

The "Feet of 26 AWG" shown on the screen at the last loss setting where the tester will display "READY" is the amount of additional cable that can be added to the line under test. If you are very close to the central office, it may be possible to add all 15 dB of loss provided by the tester without causing "Line Sync Lost". If this happens, the message ">5630 feet of 26 AWG" will appear. Press Exit to return to the main test menu or press any function key to begin a new function.

Auto Loss Test

Press Auto from the screen above and the tester will automatically determine the maximum loss allowed and display it in a screen similar to the following:



The top two lines of this screen display the maximum loss and the equivalent length of cable that can be added to the line. Line three shows the error rate performance of the line at the maximum allowable loss setting. To repeat the auto loss test, press Auto again.

In the above screen, the error rate shown is 2.432 errors in 100,000,000 bits (2.432 E-08). The message "OK" or "BAD" will appear after the actual error rate performance displayed in line three to let you know if the error rate is in specification ("OK") or out of specification ("BAD"). The specification calls for an error rate of no more than 1 x E-07 for 2B1Q lines and no more than 1 x E-06 for AMI lines. If no errors have been detected, the message "No Errors" will be displayed on line three.

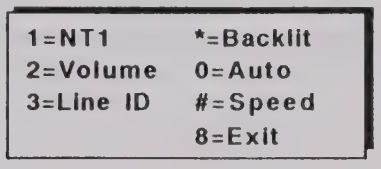
When performing automatic insertion loss tests at the "U" interface of ISDN lines, the ISDN 1000 will use the minimum error rate performance described in the applicable line specification to determine how much additional loss can be added in order to improve the accuracy of the test. If the minimum error rate is not exceeded after adding 15 dB of loss, the message ">5630 feet of 26 AWG" will appear.

NT1 TESTING

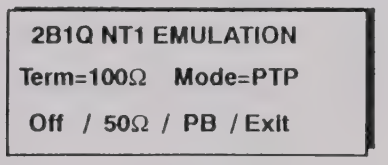
The tester can be configured as an NT1 for ISDN lines. If you suspect an NT1 connected to an ISDN line is defective, set up the tester as an NT1 and replace the suspected unit. If the line functions normally after the substitution, it will confirm the defective NT1. If the problem persists after the substitution, it will confirm the problem is not in the NT1. Using the tester as an NT1 will also allow connection and testing of an ISDN TE to an ISDN line when a working NT1 is unavailable.

Setting Up and Installing the Tester as an NT1

To install the tester as an NT1, connect the "U" interface of the ISDN line to the LINE jack and the TE "S/T" interface to the TERMINAL jack. Configure the tester to the line manually by pressing the correct line type key or automatically by using autoconfigure (<SHIFT><AUTO>). Press <SHIFT> and the following screen will appear:



Press <1> to set up the tester as an NT1. The selected line type LED and <SHIFT> LED's will remain lit. A screen similar to the following will appear:



The line sync and active LED's will display the status of the "U" interface. The line TEI and link LED's are inactive in this mode. The terminal sync and active LED's will display the status of the TE "S/T" interface.

Line one on the screen will display either "AMI NT1 EMULATION" or "2B1Q NT1 EMULATION" indicating the line type selected. The second line on the screen will display the termination option and mode option selected for the NT1 emulation. These options correspond to the strap options on a typical NT1. The termination options are "None", "50Ω" and "100Ω". The mode options are "PB" (passive bus) and "PTP" (point to point extended passive bus).

The softkeys on line four are used to select options. The first softkey toggles back and forth between On and Off. When the softkey reads On, the termination option "None" will be selected and the second softkey will be blank. When the softkey reads Off the second softkey toggles the option between 50Ω and 100Ω. The third softkey toggles the mode selection between PB and PTP.

Terminating the NT1 Mode

Terminate the NT1 mode by pressing Exit and the tester returns to "READY". Other than turning the tester off, this is the only way to exit the NT1 emulation mode. When the NT1 mode is terminated, the tester will again function as a combined TE/NT1. The TE connected to the TERMINAL jack will no longer function and should be disconnected.

BRITL TESTING

BRITL is an ISDN BRI Test Line facility only available on AT&T 5ESS switches, version 5E5 or higher. It will allow an ISDN telephone to verify basic operation of an ISDN line. The tester can be used in the same way and will display BRITL messages. BRITL test facilities include:

- Verify the Line Card Equipment Number (LCEN).
- Verify the Primary Directory Number (DN).
- Run Bit Error Rate Tests on either B channel.
- Verify call appearance and feature button mapping.

How to Access BRITL and Run Tests

Dial the BRITL test number using manual or speed dial. After you have been connected, a second dial tone will be heard on the tester's speaker and a message will appear on the screen to indicate a successful connection.

Codes can now be entered from the keypad to run tests as follows:

- **Press *, 3, #**

The line card equipment number (LCEN) will be displayed on the screen.

- **Press *, 4, #**

The primary directory number (DN) or multiline hunt group number will be displayed on the screen.

- **Press *, 1, 1, 1, #**

An error rate test is run on the B1 channel and the results will be displayed on the screen.

- **Press *, 1, 1, 2, #**

An error rate test is run on the B2 channel and the results will be displayed on the screen.

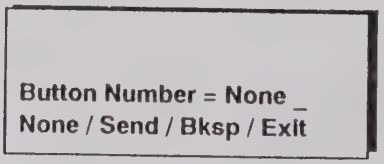
Press <CALL> to release the BRITL line and return the tester to "READY". For more detailed information about other BRITL tests, refer to AT&T BRITL documentation.

Button Emulation

This feature is useful for determining the button configuration of the line under test, and comparing it with the service order requirements. The test can be run using the ISDN 1000 as a TE or TE/NT1.

Using Button Emulation:

- Dial the BRITL number and connect to the test facility.
- Press Butn (Softkey 2) and the following screen will appear:



- Enter a button number from 1 to 255 using the keypad.
- Press Send and a message describing the telephone number or feature configured for that button will be sent by the switch to the tester, and will be displayed on the LCD screen.
- To send another button number, press Butn (Softkey 2) and begin again.
- Press None to blank out a button number that has been entered.
- Press Bksp to edit a button number being entered.

LINE ID TESTING

For most analog (POTS) switches and for AT&T 5ESS ISDN switches equipped with BRITL test facilities, there is an automated method for telephone company installers and repair technicians to determine the directory number assigned to a line being tested.

For POTS lines, this function is provided by calling the ANA (Automatic Number Annunciator) number and listening as a synthesized voice speaks the directory number assigned to the line from which you are calling.

For AT&T ISDN switches with BRITL facilities, this function is provided by calling the BRITL number on the line under test and then entering the correct code. The AT&T ISDN switch will transmit the directory number back to the requester where it will be displayed on the ISDN telephone set display.

Automatic Line ID

The ISDN 1000 tester provides an automatic method of accessing ANA and BRITL facilities. In order to use this function, the POTS ANA and BRITL telephone numbers must be entered in the Line ID configuration menu described in the Configuring Section of this manual and the tester must display the "READY" message. Press <SHIFT> and the following screen will appear:

1=NT1	*=Backlit
2=Volume	0=Auto
3=Line ID	#=Speed
	8=Exit

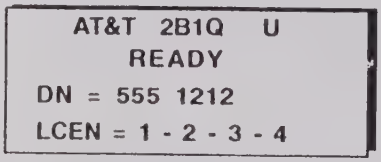
Press <3> to enable the Line ID function.

For POTS

If you are on a POTS line, the tester will automatically dial and connect you to the ANA number. You can listen to the directory number through the speakerphone. To disconnect, press <CALL> and you will return to "READY".

For ISDN

If you are on an AT&T ISDN line, the tester will automatically access the BRITL number, enter the proper key sequences, acquire both the directory number (DN) and the line card equipment number (LCEN), disconnect the call and return to "READY" with DN and LCEN ID numbers displayed as in the following screen:



Pressing any function key will erase the ID numbers from the screen and start the new function. Normal call progress status messages will be displayed if a BRITL call cannot be connected. If the tester is configured for a Northern Telecom switch or a P-Phone (EBS) line and you try to execute this function, the message "Line ID Not Valid For This Configuration" will appear.

LINE SYNC TESTING

There are four line LED's and two terminal LED's in the upper right portion of the tester. These LED's show the status of ISDN lines connected to the tester. They are not used for POTS or P-Phone (EBS) lines.

When the tester is connected to the "U" or "S/T" interface of an ISDN line, the four line status LED's are used and the terminal LED's are not used. When the tester is installed as an NT1, the line sync and active LED's show the status of the "U" interface, the terminal sync and active LED's show the status of the "S/T" interface and the line TEI and link LED's are not used.

All four LED's must be lit for the line to function properly. LED's are on when the indicated event is active and off when the event is inactive. The LED's appear in the same order as the sequence of events that occur as the tester synchronizes to an ISDN line. On a normal line, the LED's will come on in sequence with the top one first. Below is a description of the LED's:

LINE

SYNC	Is on when sync is established.
ACTIVE	Is on when the line is activated.
TEI	Is on when a TEI is assigned. If a TEI has been manually configured in the tester, this LED will always be on.
LINK	Is on when multiframing is established.

TERMINAL

SYNC	Is on when sync is established.
ACTIVE	Is on when the line is activated.

If a tester only achieves partial line synchronization, status messages appear in the display which reflect the status of the LED's.

ISDN protocol provides for dropouts of up to four seconds at layer one of the protocol without dropping synchronization. Dropouts of this type typically happen when the line is noisy. When dropouts occur, you will see the line sync LED blink on and off while the line TEI and link LED's remain lit without blinking.

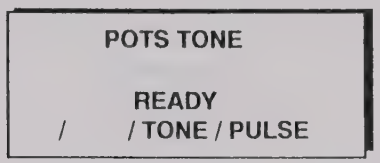
LINE POWER TESTING

LINE POWER PS1 and PS2 LED's are located just below the LINE and TERMINAL LED's in the upper right portion of the tester. PS1 indicates the status of sealing current on POTS, P-Phone and the "U" interface of ISDN lines, and the status of phantom power on the "S/T" interface of ISDN lines. PS2 indicates the status of auxilliary power at the U and "S/T" interface of ISDN lines.

When the LED is on, power is present and polarity is correct. When the LED is off, power is not present. When the LED is blinking on a regular basis, power is present and polarity is reversed.

POTS TESTING

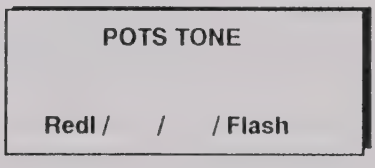
To use the ISDN 1000 for POTS line testing, connect the POTS line to the RJ45 LINE jack and press the <POTS> line key. A screen similar to the following will appear:



To change the dialing method displayed, press Tone or Pulse. The selection will appear on the screen.

To Initiate and Answer Calls

Press <CALL> to begin the call. A screen similar to the following will appear:



A number may be dialed using the keypad or redialed by pressing Redl. Call progress messages will be displayed. A momentary on hook may be generated by pressing Flash. Terminate the call by pressing <CALL> again. Answer an incoming call by pressing <CALL>. Refer to the Calling Section for more instructions.

Incoming Caller ID

The ISDN 1000 supports incoming caller ID when provided under CLASS service. Incoming caller ID will be displayed on the top line of the display when an inoming call is received on a CLASS line.

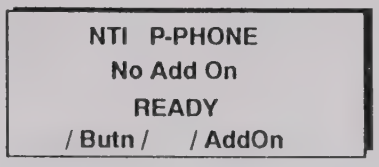
Only Functions Applicable to POTS Can Be Enabled

Many tests, functions and menu choices available in the ISDN 1000 are for ISDN and not POTS lines. To avoid confusion, tests, functions and menu choices not available in POTS mode are prevented from being used. The following functions are not available for POTS testing:

Errored Seconds Test
Loss Tests
NT1 Emulation
Status Screens (Show only "POTS")
Parts of Configuration
Switch, SPID, T-Term and TEI
Call Appearance Numbers

P-PHONE TESTING

In order to use the ISDN 1000 for P-Phone (EBS) line testing, connect the P-Phone line to the RJ45 LINE jack and press the <P-PHONE> line key. The following screen will appear:



The tester can simulate a primary set or a primary set with 18, 20 or 36 button addons. To select the type of addon to be simulated, press AddOn.

To Initiate and Answer Calls

Press <CALL> to go off hook and draw dial tone on the primary directory number, or Press Butn to enter the button number of the secondary directory number on which you wish to place the call.

Call progress messages will appear on the screen as the call proceeds. Terminate the call by pressing <CALL> again. Answer an incoming call by pressing <CALL>. The top two lines of the LCD will display messages (such as Incoming Caller ID) that normally would appear on a P-Phone station set. Refer to the Calling Section of this manual for more instructions.

Only Functions Applicable to P-PHONE Can Be Enabled

Many tests, functions and menu choices available in the ISDN 1000 are for ISDN and not P-Phone lines. To avoid confusion, tests, functions and menu choices not available in P-Phone mode are prevented from being used. Functions are not available for P-Phone testing are:

Errored Seconds Test
Loss Tests
NT1 Emulation
Status Screens
Parts of Configuration
Switch, SPID, T-Term and TEI

Section 12
Appendix

Appendix A - Maintenance

A soft cloth with water or a weak mixture of water and window cleaning fluid can be used to clean the tester. Before cleaning, disconnect the AC adapter and any other connections to lines or handsets.

If you are missing any of the items listed in the Unpacking section of this manual or if any of the following situations occur, please contact a Digitech representative at (203) 438-3731:

- The tester has been dropped or the case has been damaged.
- Liquid has gotten into the body of the tester.
- The tester does not operate properly by following the manual instructions.

Before returning the unit for repair, call Digitech for return instructions. Repairs for the USA will be done at Digitech's main office at 66 Grove Street, Ridgefield, CT 06877.

Battery Replacement

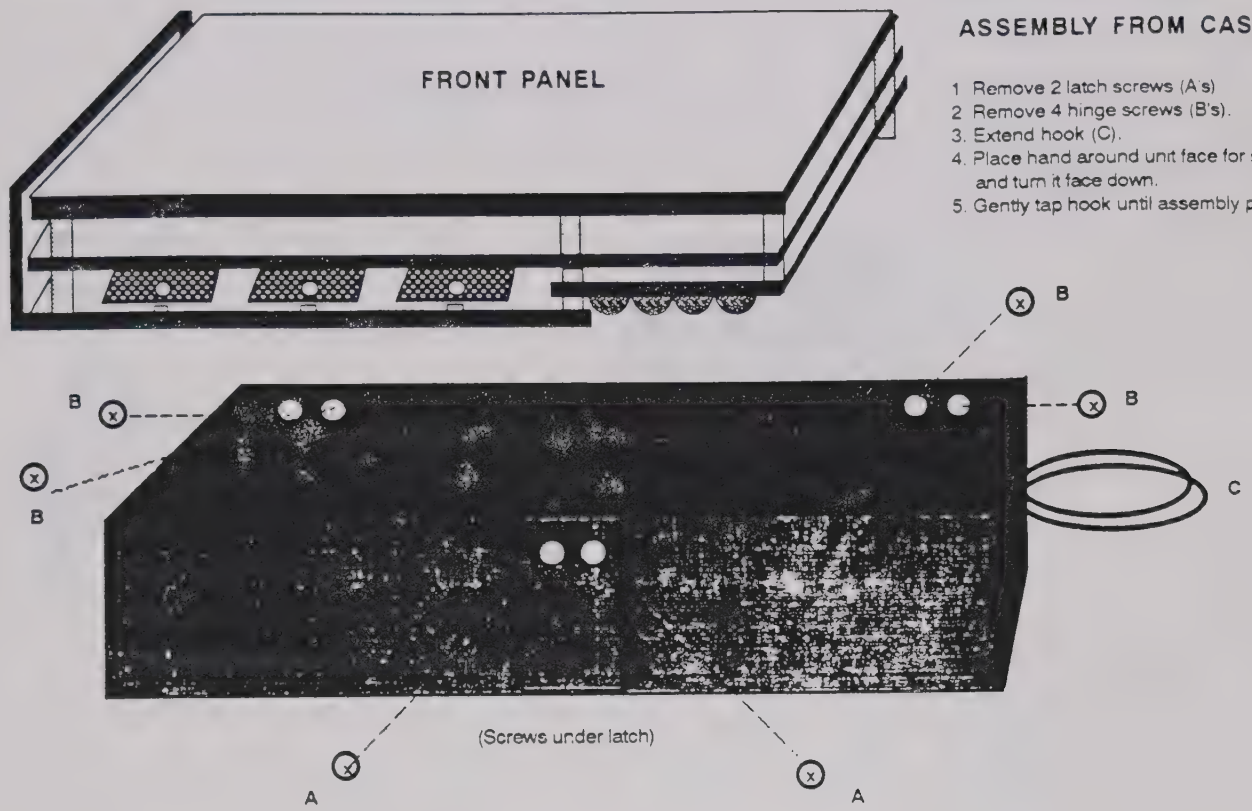
- Refer to Drawing 12-2B in this section for instructions about how to replace the internal battery pack.

Upgrades

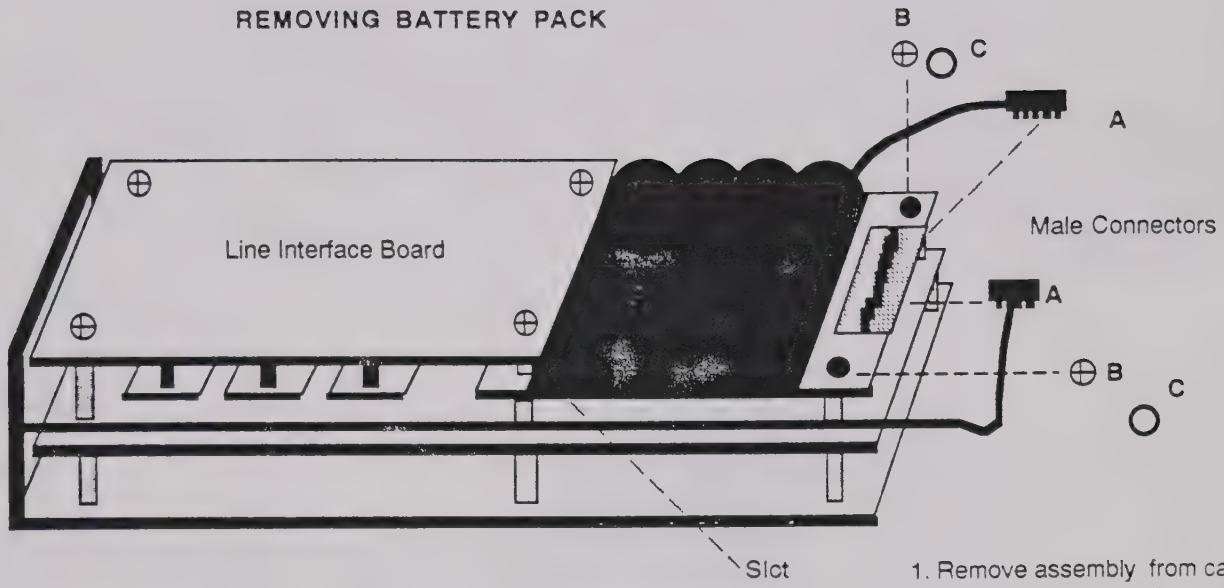
- Refer to Drawing 12-2D in this section for instructions about how to install or remove line interface modules.
- Refer to Drawing 12-2E in this section for instructions about how to install firmware upgrades.

REMOVING TESTER ASSEMBLY FROM CASE

1. Remove 2 latch screws (A's)
2. Remove 4 hinge screws (B's).
3. Extend hook (C).
4. Place hand around unit face for support and turn it face down.
5. Gently tap hook until assembly pops into hand.



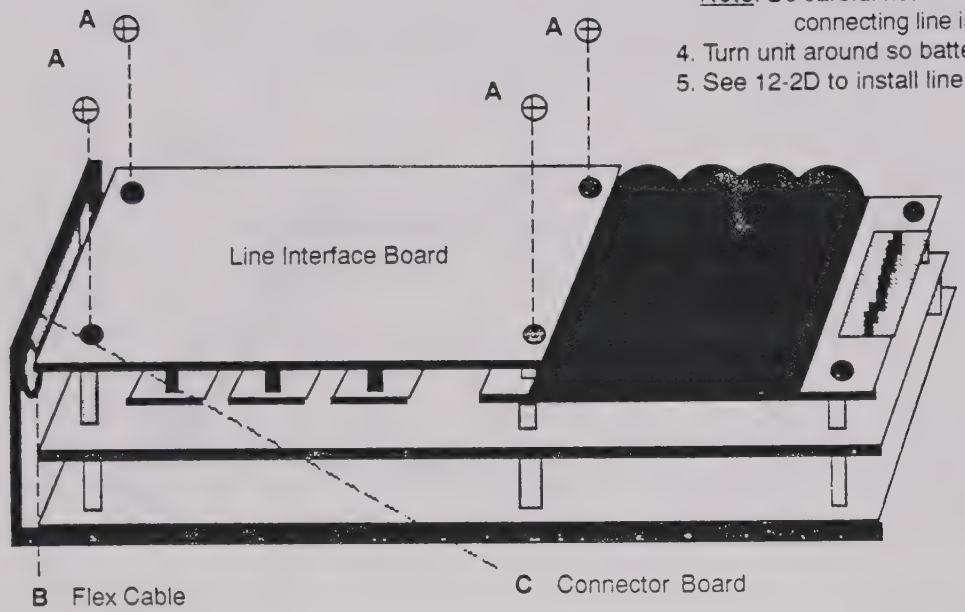
REMOVING BATTERY PACK



1. Remove assembly from case. (See Drawing 12-2A.)
2. Remove 2 connectors (A 's).
3. Remove 2 screws (B's) and 2 washers (C's).
4. Slowly slide pack out of slot and up over male connectors.

REMOVING LINE INTERFACE BOARD
(to install or remove interface modules)

1. Remove assembly from case.
   (See Drawing 12-2A.)
2. Remove 4 screws (A's).
3. Gently pull line interface board off connectors
   with rocking motion.
   Note: Be careful not to damage flex cable (B)
   connecting line interface board to connector board (C).
4. Turn unit around so battery pack is on left.
5. See 12-2D to install line interface modules.

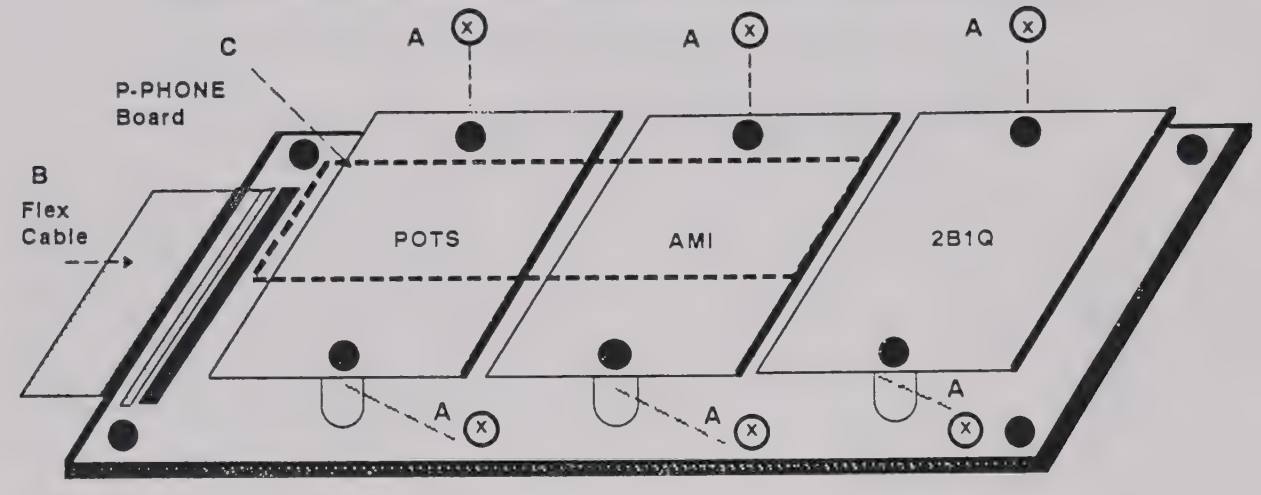


INSTALLING OR REMOVING LINE INTERFACE MODULES

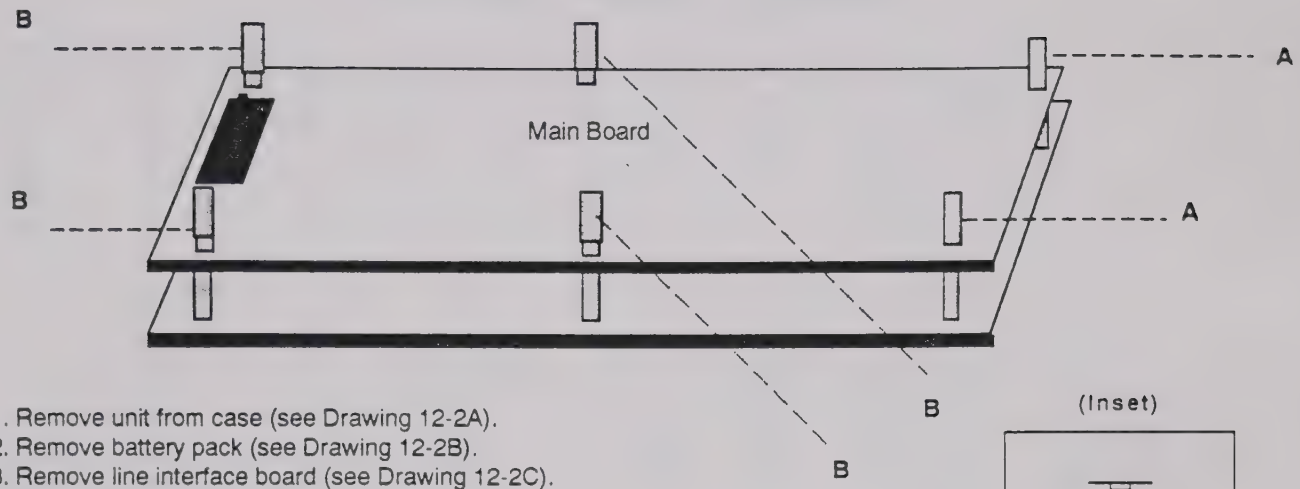
(Diagram shows all available interfaces in correct order of installation.)

1. Remove assembly from case. (see Drawing 12-2A).
2. Remove battery pack (see Drawing 12-2B).
3. Remove line interface board (see Drawing 12-2C.
4. To avoid unnecessary strain on flex cable (B), rest line interface board on unit case.
5. To add a board, place board over open slot with connector holes over connectors and insert screws.
6. To remove a module, simply unscrew connector screws (A's) and slowly lift board straight up.

   Note: To install or remove the P-Phone board (C), remove POTS and AMI boards first..



INSTALLING FIRMWARE UPGRADES



(Inset)

1. Remove unit from case (see Drawing 12-2A).
2. Remove battery pack (see Drawing 12-2B).
3. Remove line interface board (see Drawing 12-2C).
4. Remove 4 stand-offs (A's and B's) with 1/4" nut driver.
   B's are slotted stand-offs for battery pack.
5. Gently lift off main board and turn upside down.
6. Use flat head screw driver or chip extractor to gently lift off Digitech chip (C).
   (Chip has white Digitech label indicating software revision level.
7. To replace chip, align slot in chip with outline of slot on board.
   (See Inset.) Put one side in first.

Appendix B - Standard Accessories Included with your ISDN 1000:

- **Basic unit** — ISDN 1000 hand-held line tester and internal battery pack, standard POTS and ISDN S/T interfaces and optional interfaces ordered will be installed.

- **Cables**

RJ45 to RJ 45	Connects the tester to an RJ45 jack.
RJ45 to RJ11	Connects the tester to an RJ11 jack.
RJ45 to two alligator clips	Connects the tester to terminal block. (Clips can be specified as regular or miniature.)

- **AC adapter** — 120V to 16VDC, recharges internal batteries.

- **User manual** — Instructions on how to use the tester.

Optional Accessories for the ISDN 1000 are:

- **Interfaces**

AMI	For connection to AT&T AMI ISDN lines.
2B1Q	For connection to all 2B1Q ISDN lines.
EBS (P-Phone)	For connection to Northern Telecom EBS lines.

- **Softpak** — For easy transport and protection of unit.

- **Cables**

RJ45 to four alligator clips	Connects unit to terminal block. (Clips can be specified as regular or miniature.)
RJ11 to two alligator clips	Connects unit to a butt-in set equipped only with allligator clips.

• **External battery pack**	Power supply for the tester when the internal battery is empty and AC power is not available. Uses-off-the-shelf rechargeable batteries.
• **Internal battery pack**	Rechargeable batteries to power the tester.
• **Headset**	Used as a light-weight, externally connected handset for voice.
• **Training tape**	VHS VCR tape for ISDN 1000 video training.
• **Quick Reference Card**	Laminated pocket-sized quick reference instruction card.

Appendix C - ISDN Protocol State Cross Reference Tables

S/T Interface F and G States

F states describe the state of the Terminal Equipment connected to the ISDN 1000 in the NT1 emulation mode. G states describe the state of the Network Termination device when the ISDN 1000 is in line test mode and is connected to the S/T interface of an NT1.

		Terminal LED Indicators	
F States	**Description**	**Sync**	**Active**
F1	**Inactive** - TE not powered on.	Off	Off
F2	**Sensing** - TE on but receive signal type not determined.	Off	Off
F3	**Deactivated** - neither side transmitting.	Off	Off
F4	**Awaiting Signal** - TE transmits info 1.	On	Off
F5	**Identifying Input** - after receiving any signal, the TE stops transmitting and waits for Info 2 and Info 4.	Off	Off
F6	**Synchronized** - after receiving Info 2, the TE transmits Info 3 and waits for Info 4.	On	On
F7	**Activated** - normal active state. TE transmits Info 3 and receives Info 4.	On	On
F8	**Lost Framing** - after loss of frame synchronization, the TE stops transmitting and waits for Info 0, Info 2 or Info 4.	Off	Off

		Terminal LED Indicators	
G States	**Description**	**Sync**	**Active**
G1	**Inactive** - NT not transmitting.	Off	Off
G2	**Pending Activation** - NT sends Info 2 and waits for Info 3.	On	On
G3	**Active** - Normal active state. NT transmits Info 4 and receives Info 3.	On	On
G4	**Pending Deactivation** - NT not transmitting.	Off	Off

LAPD States

The LAPD state is the state of the TE's LAPD Layer 2. LAPD states are summarized in the table below.

States	Description	Line LED Indicators	
		TEI	Link
1	Terminal Endpoint Identifier (TEI) unassigned.	Off	Off
2	TEI assigned state.	On	Off
3	Awaiting established state.	On	Off
4	Awaiting release state.	On	Off
5	Normal state.	On	On

Call States

The Call state is the state of the TE's Layer 3. Call states are summarized in the table below. The ISDN 1000 will display the U number of the Call state on the status screen and will show the English translation on the tester's LCD display in real time as the call proceeds.

U States	Description
U0	Null
U1	Call Initialized
U2	Overlap Sending
U3	Outgoing Call Proceeding
U4	Call Delivered
U6	Call Present
U7	Call Received
U8	Connect Request
U9	Incoming Call Preceeding
U10	Active
U11	Disconnect Request
U12	Disconnect Indication
U19	Release Request

Cause Messages

Cause messages are shown on the bottom line of the tester's LCD display. Cause messages are sent from the switch to the terminal equipment typically to inform the user of network status.

Number	Description	Display
1	Unassigned number	UNASSIGNED NUMBER
2	No route to specified network	NO ROUTE AVAILABLE
16	Normal, clearing	NORMAL
17	User busy	USER BUSY
18	No user responding	NO USER RESPONSE
21	Call rejected	CALL REJECTED
22	Number changed	NUMBER CHANGED
29	Requested facility rejected	FACILITY REJECT
30	Response to status inquiry	RESP TO STAT ENQ
31	Normal, unspecified	NORMAL
34	No channel available	NO CHANNELS
41	Temporary failure	TEMPORARY FAIL
42	Network congestion	NET CONGESTION
43	Access information discarded	ACCESS INFO DISC
50	Requested facility not subscribed	REQ FAC NOT SUB
52	Outgoing calls barred	CAN'T CALL OUT
54	Incoming calles barred	CAN'T CALL IN
58	Bearer capability not presently available	BRER CAP NOT AVL
65	Berarer service not implemented	BRER SVC NOT IMP
66	Channel type not implemented	CHAN TYPE N/I
69	Requested facility not implemented	REQ FAC NOT IMP
81	Invalid call reference value	INVALID CRV
82	Indentified channel does not exist	BAD CHANNEL ID
85	Invalid digit value for number	DIGIT INVALID
88	Incompatible destination	INCOMPATIBLE DEST

Number	Description	Display
91	Transit network does not exist	TRANS NET N/EXIST
96	Mandatory information element is missing	MANDATORY MISS
97	Message type nonexistent or not implemented	MSG BAD OR N/I
98	Message not compatible with call state	MSG BAD - CALL STATE
100	Invalid information element contents	BAD INFO ELEM
111	Protocol error, unspecified	UNSPEC PROT ERR
127	Interworking, unspecified	INTERWORKING

SPECIFICATIONS

FEATURES

Display	Supertwist Liquid Crystal Display (LCD), 4 rows x 20 characters,backlit
User Interface	Menu and softkey driven, autoconfiguration and autotest modes
Interfaces	Up to five interfaces may be installed simultaneously: S/T, AMI, 2B1Q, P-Phone, POTS

PHYSICAL

Power	Rechargeable internal battery pack, AC adapter
Automatic Power-Off	Shut-off occurs after a user-programmable period of no activity, time and set of conditions
Battery Life	4-7 hours per charge, depending on the line interface selected
Weight	3 pounds
Handling	Dust and shock resistant

INDICATORS

Line Interface	Synchronization, activation, TEI assignment, data link establishment
Terminal Interface	Synchronization, activation
DSL Power	Sealing current ("U" interface, POTS, P-Phone), power sources 1 and 2 (U and S/T interfaces)
Tester Power	Low battery, battery charging

FUNCTIONS

CALL	Place and receive circuit-switched calls
STATUS	Display switch and terminal type, TEI assignment, layer 3 status, loopback status and channel assignment
TEST	Errored Seconds - monitoring and reporting line errors, error rate performance Loss Insertion - 0-15db at both the U and S/T interface; display loss, error rate and equivalent cable length; auto mode
CONFIG	Switch type, SPID, T termination, TEI, speed dial numbers and names, line ID numbers, automatic power-off conditions
SHIFT (SPECIAL)	NT1 emulation, volume adjustment, automatic line identification, backlight, autoconfiguration, speed dial, redial

AMI INTERFACE

Signal	AMI encoding, 160 KBPS (80 KHz), +10.7dBm, 2.45V peak
Impedence	120Ω AC, >10K DC
Loop Range	10 Kft of 26 AWG equalling 32dB of attenuation
Compatibility	AT&T 801-802-100, 5D5-900-311

S/T INTERFACE

Signal	ASI encoding, 192 KBPS (96 KHz), +750mV peak
Impedence	50Ω, 100Ω, Hi-z selectable
Loop Range	3 Kft equalling 6dB of attenuation
Compatibility	CCITT I.430, ANSI T.605, AT&T 801-802-100, 5D5-900-311 Northern Telecomm NIS S802-4

2B1Q INTERFACE

Signal	2B1Q encoding, 160 BPS (40 KHz), +14.0 dBm, 2.5V peak
Impedence	135Ω AC, >10K DC
Loop Range	18 Kft of 26 AWG equalling 42dB of attenuation
Compatibility	ANSI T.601 AT&T 801-802-100, 235-900-321 Northern Telecomm NIS S802-5

P-PHONE INTERFACE

Signal	Analog voice with 8KHz ASK carrier
Impedence	900 ohm AC, 6700 ohm DC
Loop Range	1230Ω with maximum of 24dB of attenuation
Compatibility	Northern Telecomm NIS S106

POTS INTERFACE

Signal	Analog voice with 300Hz-3KHz, DTMF/Pulse
Impedence	600Ω AC (talk), > 100K (monitor) AC 180Ω DC (talk), > 50K (monitor) DC
Loop Range	2000Ω maximum
Compatibility	Bellcore TR-TSY-000344, TR-TSY-000031

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